from both MRA and CTA should be compared to properly plan the treatment for the patient.

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REFERENCES

1. Chang JB, Stein TA, Hajee M, Diamond A, Lustrin E, Warshall C. Computed tomography in the decision for carotid endarterectomy. Int J Angiol 2002;11:203-6.
2. Modaresi KB, Cox TCS, Summers PE, Jarosz JM, Verma H, Taylor PR, et al. Comparison of intra-arterial digital subtraction angiography, magnetic angiography and duplex ultrasonography for measuring carotid artery stenosis. Br J Surg 1999;86:1422-6.
3. Fürst G, Saleh A, Wenserski F, Malms J, Cohnen M, Aulich A, et al. Reliability and validity of noninvasive imaging of internal carotid artery pseudo-occlusion. Stroke 1999;30:1444-9.
4. Hirai T, Korogi Y, Ono K, Murata Y, Takahashi M, Suginohara K, et al. Maximum stenosis of extracranial internal carotid artery: effect of luminal morphology on stenosis measurement by using CT angiography and conventional DSA. Radiology 2001;22:802-9.

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Reply

We appreciate your inquiry into our recent work with carotid magnetic resonance angiography (MRA) and have several comments. Overestimation of the severity of carotid disease by "time-of-flight" MRA has been primarily explained by a better understanding of the "flow void" phenomenon occurring with disturbed flow past higher grade carotid stenoses.[1] The threshold stenosis severity causing a flow gap will differ between institutions, MRA techniques, and postprocessing imaging used. This requires individual institution validation of MRA against a known standard (most likely contrast arteriography). A threshold of >60 % arteriographic stenosis was found in our earlier study .[1] Stenoses greater than the threshold diameter reduction seen on arteriography will not be directly measurable by MRA in the presence of a flow void potentially leading to overestimation. Secondly, Nederkoorn and colleagues[2] have nicely shown that overestimation of stenosis severity does not occur in the absence of a flow gap when the same projections of MRA and contrast arteriography are compared. Since MRA projections are typically displayed in sequential 15° rotations, more than standard anterior-posterior and lateral arteriographic views may be required to accurately define the degree of stenosis.

As we noted both in this article and in our previous study, MRA has correctly differentiated near occlusions from complete occlusions in our experience.[1] When our MRA definition for internal carotid artery occlusion was used, 18 of 19 patients had internal carotid patency accurately resolved by MRA and 2 of 3 patients required arteriography to determine operability (not resolve patency). We have limited experience with carotid computed tomographic angiography but acknowledge that it may serve as a complementary imaging modality.

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REFERENCES

1. Back MR, Wilson JS, Rushing G, Stordahl N, Linden C, Johnson BL, et al. MRA is an accurate imaging adjunct to duplex ultrasound scanning in patient selection for carotid endarterectomy. J Vasc Surg 2000;32:429-40.
2. Nederkoorn PJ, Elgersma O, Mali WP, Eikelboom BC, Kappelle LJ, van der Graaf Y. Overestimation of carotid artery stenosis with MRA compared with digital subtraction angiography. J Vasc Surg 2002;36:806-13.

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Regarding "Factors that predict prolonged length of stay after aortic surgery"

We read with interest the recent article by Chang et al (J Vasc Surg 2003;38:335-9). Whilst we acknowledge the fantastic results reported—including a mortality rate of only 0.4%, which is far superior to other reports[1,2]—we would like to draw attention to the interpretation attributed to renal impairment as a risk factor for prolonged stay. Chang et al's definition of preoperative renal insufficiency was a serum creatinine of over 2.0 mg/dL (182 μmol/L). We believe this to be excessively high, thus accounting for the very low number of patients (5.4%) in this risk group and the difficulty in analyzing this risk factor, as recognized by the authors themselves. The United Kingdom Small Aneurysm Trial recognized renal impairment as a significant risk factor in postoperative mortality, though in this trial impairment occurred in 5.6 % compared with 0.4% in the study by Chang et al. Patients who died had a mean creatinine of 122.2 μmol/L (1.34 mg/dL) compared with 107.4 μmol/L (1.18mg/dL) for survivors. Furthermore, each 40 μmol/L increase in serum creatinine increased mortality by 40%.[2]

The choice of a threshold value for abnormal serum creatinine is largely arbitrary as up to 60% of renal function can be lost before development of abnormally high serum creatinine.[3] In our hospital normal serum creatinine is defined as below 120 μmol/L (1.32 mg/dL) for men and 97 μmol/L (1.07mg/dL) for women. However, a recent study of peripheral vascular disease patients suggested that even this may be too high.[4] Our group found that over 80% of peripheral vascular disease patients with normal serum creatinine had impaired renal function as defined by creatinine clearance (CrCl), normal being over 100mL/min. Of these, over 70% had a CrCl below 60mL/min, at least 40% below normal. Serum creatinine above 85 μmol/L (0.94mg/dL) was found to significantly predict a reduced creatinine clearance.[4]

In conclusion, we recommend that for peripheral vascular disease patients a threshold value of 85 to 120 μmol/L (0.94-1.32mg/dL) serum creatinine be used. This would more accurately reflect the significant burden of renal disease in this patient population. Creatinine clearance remains, however, a better and more accurate measure of renal function than serum creatinine.

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REFERENCES

1. Blankensteijn JD, Lindenburg FP, Van der Graaf Y, Eikelboom BC. Influence of study design on reported mortality and morbidity rates after abdominal aortic aneurysm repair. Br J Surg 1998;85:1624-30.
2. Brady AR, Fowkes FG, Greenhalgh RM, Powell JT, Ruckley CV, Thompson SG. Risk factors for postoperative death following elective surgical repair of abdominal aortic aneurysm: results from the UK Small Aneurysm Trial. On behalf of the UK Small Aneurysm Trial participants. Br J Surg 2000;87:742-9.
3. Mayne PD. Clinical chemistry in diagnosis and treatment. London: Edward Arnold, 1994.
4. Rashid ST, Agarwal S, Hamilton G. Discovering renal impairment in peripheral vascular disease using creatinine clearance in patients with normal serum creatinine [Programme and Abstract Book]. European

Society for Vascular Surgery XVII Annual Meeting; Dublin, Ireland; Sep 7-9, 2003. p. 110-111.

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Reply

We agree that serum creatinine higher than 1.32 ng/dL may be a more accurate reflection of underlying renal insufficiency than 2.0 ng/cL. The latter value was an arbitrary level that we chose on the basis of our vascular registry scoring system and our previous impression that patients who underwent infrarenal aortic surgery rarely if ever developed renal failure when their serum creatinine was lower than this level. We also agree that creatinine clearance is a more accurate reflection of renal function than serum creatinine. Future studies should record the exact creatinine value.

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